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Research Article

Decorative 18th Century Blue-and-White Portuguese Tile Panels: A Type-Case of Environmental Degradation

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Decorated glazed ceramic tiles are used as an ornamental art, constituting an important cultural heritage whose preservation is mandatory. Environmental conditions are responsible for the degradation of exposed ancient tile panels originating various pathologies, related to the development of microorganisms. This is the case of a valuable 18th century blue-and-white Portuguese tile panel called “Cura do Cego,” belonging to the collection of the National Tile Museum (MNAz), where green stains are nowadays observable in the glaze. A prospective diagnosis of this green tarnishing was the aim of the present work. Small tile fragments were directly irradiated using nondestructive techniques: X-ray fluorescence spectrometry with a wavelength-dispersive system (WDXRF) for chemical characterization of the tile glaze and X-ray powder diffraction (XRD) to assess the phase constitution of both the glaze and the ceramic body. A destructive technique (scanning electron microscopy with energy-dispersive system (SEM/EDS)) was applied to tentatively infer the chemical changes induced in the glaze by the green staining and also to characterize the morphology of the microorganisms associated to this staining. The obtained results are reported and discussed, as a preliminary step for testing an innovative nondestructive decontamination technique applying gamma radiation, particularly suitable for overcoming such tile pathologies.

1. Introduction

“Azulejos”—Portuguese word designating glazed ceramic tiles—have been widely used along the last five centuries, covering the interior or placed in the exterior (façades) of churches, monasteries, and palaces, and have been progressively applied in other constructions like particular houses and underground stations [1] linking aesthetic qualities to utilitarian and practical functions.

This valuable cultural heritage deserves nowadays particular attention due to the serious degradation presented by some decorative tile panels, a concern that has pushed

the Portuguese National Tile Museum in Lisbon (*Museu Nacional do Azulejo* (MNAz)) to promote the training of specialized personnel in conservation and restoration in the last decades with the purpose of desirably eliminating the agents responsible for the deterioration of ancient tiles [2].

Many deteriorating environmental effects have been recognized on outdoor glazed ceramics [3].

Most of them are due to rainwater, sun heat, and air currents, but inside the buildings, liquid water and vapor ascending through the porous system of the ceramic body may also give rise to pathologies causing the degradation of the decorative tiles. The formation of soluble salts at